Sheet (2)

(1) If a transmitter produces 50 watts of power, express the transmit power in units of dBm, and dBw.

If 50 watts is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100m from the antenna. What is P_r (10 km)? Antenna unity gain for the receiver antenna.

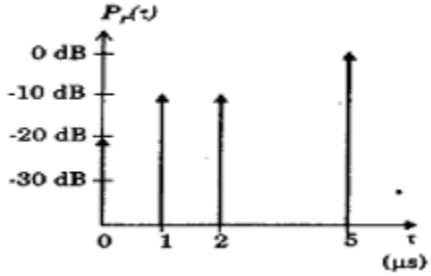
(2) Assume a receiver is located 10 km from a 50-watt transmitter. The carrier frequency is 900 MHz, free space propagation is assumed, G_t=1, and G_r=2, find

a) The power at the receiver.
b) The magnitude of the E-field at the receiver antenna.
c) The rms voltage applied to the receiver input assuming that the receiver antenna has a purely real impedance of 50 Ω.

(3) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, compute the received carrier frequency if the mobile is moving

a) Directly towards the transmitter.
b) Directly away from the transmitter.
c) In the direction which is perpendicular to the direction of arrival of the transmitted signal.

(4) Calculate the mean excess delay and the rms delay spread for the multipath profile given in figure below. Calculate B_c .Would this channel be suitable for AMPS or GSM service without the use of Equalizer?



(5) Determine the proper spatial sampling interval required to make small-scale propagation measurements which assume that consecutive samples are highly correlated in time. How many samples will be required over 10 m travel distance if f_c=1900 MHz and v=50 m/s. How long would it take to make these measurements, assuming they could be made in real time from a moving vehicle? What is the Doppler spread B_D for the channel?